

THE MINERAL INDUSTRY OF GREECE

By Harold Newman

The metals sector of Greek industry is a small but important part of the national economy. Bauxite is the most important of Greek metal deposits, but there are also deposits of chromite, gold, iron, lead, nickel, and zinc. Aluminum is produced from domestic sources of bauxite and alumina and, therefore, is important in the domestically integrated metals sector. The steel produced is mostly from imported scrap.

The industrial minerals sector was more important in the national economy than the metals sector. The more dynamic commodities in 1995 were bentonite, magnesite, and perlite. Important export products were bentonite, magnesite, perlite, and pumice. Privatization efforts were continuing in the magnesite and refractories industries. (*See table 1.*)

Production of mineral commodities in Greece has been closely tied to the export market. As the global recession eased and prices rose, exports of commodities produced in Greece increased. Detailed trade data for Greece have not been received in the recent past, but general information indicates that the other members of the European Union (EU) have continued to strengthen their positions as the principal destinations and sources of Greek mineral exports and imports. Selected Greek companies with major equity owners are shown in table 2.

Environmental concerns are the responsibility of the Ministry of Environment, Town Planning and Public Works. Individual industrial concerns are charged with much of the responsibility of environmental protection and, in cooperation with the Government, take an active role in environmental programs. The Government's decision to import natural gas from Russia, and possibly Algeria, was based, in part, on the fact that it is much cleaner to burn than the traditional lignite.

Parnasse Bauxite Mining Co. mined bauxite mainly from Itea. Production was down from 1994 owing to decreased demand and lower prices. Delphi-Distomon S.A. reported having achieved its planned output of 859,000 t, and planned to increase production to 914,000 t in 1996. Reportedly, the company would continue with its exploration drilling program.

Interest in gold exploration continued in 1995. The joint-venture project between Barytes Ores Mining Co. S.A. of Greece and Renison Goldfields Consolidated Ltd. of Australia on the island of Milos was continuing with systematic sampling and investigation.

The Kassandra lead-zinc mines in northern Greece have

produced lead, zinc, and silver for more than 30 years, but the gold mineralization in the associated pyrite has not been tapped. In late 1995, the mines were bought by TVX Hellas, an affiliate of TVX Gold Inc. TVX Hellas announced it intended to invest \$200 million in 1996 to expand the mines and to construct a modern plant for gold recovery from the coproduced pyrite. However, TVX Hellas suspended operations reportedly because of environmental concerns of the local authorities regarding construction of the new plant.

Larco S.A. continued to improve its overall efficiency and to increase its production of nickel. The company announced a new \$5 million investment in its facilities in 1995. This was to be expanded by an additional \$10 million in 1996.

The Hellenic Mineral Mining Co. continued asbestos mining operations at the Zidani Mine. Almost all of the 75,000 t of various grades of asbestos fibers produced were exported. The fibers are suitable for mixed applications, such as asbestos cement pipes, and roofing applications.

Barytine Co. was the leading producer of industrial minerals. The company is a major producer of bentonite, kaolinite, and perlite. Also, Lava S.A. specialized in industrial minerals, with production of gypsum from Crete, pozzolan from Milos, and pumice from the volcanic island of Yali.

Grecian Magnesite S.A. was a leading producer in the European market of calcined and dead-burned magnesia. The company continued its policy of improving productivity and engaging in research and development projects. A \$2 million project that involved the construction of a new crushing plant was underway. This was expected to improve magnesite recovery along with reducing costs.

Financial Mining, Industrial, and Shipping Corp. (FIMISCO) was taken over by Viomagn, a joint venture by the lignite producer Violignit and Alpha Finance, an investment bank. The former FIMISCO was a major producer of dead-burn magnesia and refractory bricks.

The Greek marble industry continued to expand in 1995. Greece's marble industry played a leading role in the international dimension stone market as a result of the marble's wide range of colors and uses. Greek marble is available in a variety of colors--white, semiwhite, graywhite, gray, ash, black, brown, pink, red, green, and multicolored, and is produced in almost all areas of the country.

The industry was active in three areas: the quarrying of marble blocks, the cutting of marble blocks, and the sale of

the blocks and finished products. About 80% of the marble was sold as finished products; the remainder was sold in rough slab and block form.

The state-controlled Public Power Corp. (PPC) is the exclusive producer of lignite, the predominant fuel in electricity generation in Greece. PPC was continuing exploration in the basins of Amyntaion, Elasson, Florina, Megalopolis, and Ptolemais and reportedly invested about \$70 million in the mining sector.

In the petroleum sector, Public Petroleum Corp opened bidding for concessions and received offers for six areas: Epirus, Aitoloakarnania, and Achaia (onshore) and south of Corfu, Patraikos Bay and Katakolon (offshore). These offers

were expected to be evaluated by midyear 1996.

The railroad system in Greece, all Government owned, totaled 2,479 kilometers (km), of which 1,565 km was 1.435-meter (m) standard-gauge track, 892 km 1.000-m gauge track, 100 km of double track, and 22 km 0.750-m narrow-gauge track. The highway and road system totaled 38,938 km, of which 16,090 km was paved, 13,676 km was crushed stone and gravel, 5,632 km was improved earth, and 3,540 km was unimproved earth. The inland waterway system was 80 km, consisting of three coastal canals and three unconnected rivers. The major ports are Piraeus and Thessaloniki.

TABLE 1
GREECE: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

| Commodity 2/ | 1991 | 1992 | 1993 | 1994 | 1995 e/ |
|---|------------|-------------|--------------|------------|------------|
| METALS | | | | | |
| Aluminum: | | | | | |
| Bauxite | 2,132,716 | 2,078,445 | 2,205,498 r/ | 2,196,371 | 1,916,000 |
| Alumina, Al ₂ O ₃ equivalent | 624,600 | 611,600 | 614,900 r/ | 548,000 e/ | 597,000 3/ |
| Metal: | | | | | |
| Primary | 150,878 | 150,850 | 146,800 | 144,300 | 140,000 |
| Secondary e/ | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 |
| Chromite: | | | | | |
| Run-of-mine | 99,384 | 5,000 r/ e/ | 3,500 r/ e/ | -- r/ | -- |
| Marketable products: | | | | | |
| Direct-shipping ore | 5,500 | -- | -- | -- | -- |
| Concentrate | 20,108 | -- | 3,697 r/ e/ | 1,960 e/ | -- |
| Iron and steel: | | | | | |
| Iron ore and concentrate, nickeliferous, Fe content e/ 4/ | 815,000 3/ | 610,000 | 575,000 | 810,000 | 800,000 |
| Metal: | | | | | |
| Ferroalloys: | | | | | |
| Ferchromium | 10,500 e/ | -- | -- | -- | -- |
| Ferronickel e/ | 64,000 3/ | 65,000 r/ | 45,000 | 63,000 | 65,000 |
| Steel, crude | 980,000 | 924,000 | 980,000 r/ | 847,612 | 939,170 3/ |
| Lead, mine output, Pb content by analysis | | | | | |
| | 30,707 | 27,496 | 28,812 | 28,404 | 28,000 |
| Manganese: e/ | | | | | |
| Ore, crude: | | | | | |
| Gross weight | 13,540 3/ | 14,677 | 10,000 | 8,600 | 9,000 |
| Mn content | 3,840 | 2,133 | 3,000 | 2,800 | 28,000 |
| Concentrate: | | | | | |
| Gross weight | 3,840 3/ | 3,000 | 2,500 | 2,500 | 2,500 |
| Mn content | 1,705 3/ | 2,283 | 1,125 | 900 | 1,000 |
| Nickel: | | | | | |
| Ore: | | | | | |
| Gross weight | 2,020,000 | 1,500,000 | 1,570,000 | 1,944,018 | 2,000,000 |
| Ni content of nickeliferous iron ore | 19,300 | 17,000 | 12,900 r/ | 18,821 | 19,947 3/ |
| Metal, Ni content of ferronickel | 16,000 | 15,400 | 10,900 | 16,197 | 17,164 3/ |
| Silver, mine output, Ag content kilograms | 80,762 | 63,300 | 55,900 | 60,000 e/ | 50,000 |
| Tin, metal, secondary | 200 | 200 | 200 e/ | 150 e/ | 150 |
| Zinc, mine output, Zn content by analysis | 30,686 | 26,742 | 24,854 | 17,000 | 20,000 |
| INDUSTRIAL MINERALS | | | | | |
| Abrasives, natural, emery e/ | | | | | |
| | 7,860 3/ | 7,500 | 7,100 | 7,500 | 7,500 |
| Asbestos: | | | | | |
| Ore | 285,950 | 2,178,820 | 3,626,000 e/ | 4,647,033 | 4,500,000 |
| Processed | 4,780 | 28,592 | 56,940 | 55,502 | 50,000 |
| Barite: | | | | | |
| Ore, crude e/ | | | | | |
| | 1,310 3/ | 1,000 | 1,000 | 1,000 | 1,000 |
| Concentrate | 763 | 907 | 988 | 701 | 700 |
| Cement, hydraulic | 11,800,000 | 10,700,000 | 13,925,000 | 13,500,000 | 12,000,000 |
| Clays: | | | | | |
| Bentonite: | | | | | |
| Crude | 600,286 | 600,083 | 600,000 e/ | 697,773 | 650,000 |
| Processed | 474,796 | 431,292 | 527,000 e/ | 583,140 e/ | 670,000 |
| Kaolin: | | | | | |
| Crude | 189,235 | 201,705 | 150,000 e/ | 117,254 | 125,000 |
| Processed | 20,318 | 10,993 | 10,000 e/ | 10,651 | 10,000 |
| Feldspar | 11,800 | 26,600 | 15,000 e/ | 35,000 e/ | 30,000 |
| Gypsum and anhydrite | 475,490 | 452,037 | 400,000 e/ | 453,722 | 450,000 |
| Magnesite: | | | | | |
| Crude | 506,859 | 471,220 | 500,000 e/ | 200,000 e/ | 250,000 |
| Dead-burned | 82,505 | 63,447 | 66,000 e/ | 77,000 e/ | 84,000 |
| Caustic-calcined e/ | 131,000 3/ | 55,000 | 124,000 | 122,000 | 125,000 |
| Nitrogen, N content of ammonia | 210,000 | 140,000 | 57,400 | 55,000 e/ | 60,000 |
| Perlite: | | | | | |
| Crude | 369,495 | 505,348 | 549,000 e/ | 468,699 | 440,000 |
| Screened | 286,404 | 398,360 | 350,000 e/ | 371,945 | 360,000 |
| Pozzolan (Santorin earth) | 536,320 | 664,785 | 600,000 e/ | 649,608 | 600,000 |
| Pumice | 445,143 | 635,578 | 600,000 e/ | 635,470 | 600,000 |
| Salt, all types e/ | 150,000 | 125,000 | 100,000 | 152,000 | 150,000 |
| Silica sand e/ | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 |

See footnotes at end of table.

TABLE 1--Continued
GREECE: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

| Commodity 2/ | 1991 | 1992 | 1993 | 1994 | 1995 e/ | |
|--|----------------------------|------------|---------------|------------|------------|---------|
| INDUSTRIAL MINERALS--Continued | | | | | | |
| Sodium compounds: e/ | | | | | | |
| Carbonate | 900 | 750 | 750 | 750 | 750 | |
| Sulfate | 6,000 | 6,000 | 6,000 | 6,000 | 6,000 | |
| Stone, marble | | | | | | |
| | cubic meters | 208,687 | 384,840 | 300,000 | 160,181 | 200,000 |
| Sulfur: e/ | | | | | | |
| S content of pyrites | 35,300 3/ | 25,000 | 25,000 | 25,637 3/ | 25,000 | |
| Byproduct: | | | | | | |
| Natural gas | 125,000 | 120,000 | 100,000 | 56,000 | 50,000 | |
| Petroleum | 6,000 | 5,000 | 5,000 | 5,000 | 5,000 | |
| Total sulfur | 166,300 | 150,000 | 130,000 | 86,637 | 80,000 | |
| Talc and steatite: e/ | 790 3/ | 2,240 | 700 | 400 | 500 | |
| MINERAL FUELS AND RELATED MATERIALS | | | | | | |
| Coal: | | | | | | |
| Lignite | 52,912,210 r/ | 55,089,846 | 54,817,000 r/ | 57,532,515 | 57,500,000 | |
| Lignite briquets | 160,000 r/ | 122,000 r/ | 62,000 r/ | 56,000 e/ | 50,000 | |
| Coke, gashouse e/ | 16,000 | 15,000 | 15,000 | 13,000 | 14,000 | |
| Gas: | | | | | | |
| Manufactured, gasworks e/ | million cubic meters | 18 | 18 | 18 | 15 | 16 |
| Natural | do. | 180 | 107 r/ | 82 r/ | 38 | 36 |
| Natural gas plant liquids | thousand 42-gallon barrels | -- | -- | 290 r/ | 360 | 350 |
| Petroleum: | | | | | | |
| Crude | thousand metric tons | 849 r/ | 659 r/ | 537 r/ | 549 | 465 |
| Refinery products: | | | | | | |
| Liquefied petroleum gas | do. | -- | 4,930 r/ | 4,650 r/ | 5,450 | 5,500 |
| Gasoline | do. | -- | 31,700 r/ | 29,500 r/ | 30,300 | 30,000 |
| Naphtha | do. | -- | 3,430 | 1,230 r/ | 4,670 | 4,500 |
| Mineral jelly and wax e/ | do. | 24 3/ | 15 | 15 | 15 | 15 |
| Jet fuel | do. | 11,300 | 10,600 | 10,100 r/ | 12,700 | 12,000 |
| Kerosine | do. | 39 | 101 | 78 r/ | 194 | 150 |
| Distillate fuel oil | do. | 24,300 | 28,200 | 24,300 r/ | 27,800 | 26,000 |
| Refinery gas e/ | do. | -- 3/ | 2,100 | 2,100 | 2,100 | 2,000 |
| Lubricants e/ | do. | 1,100 3/ | 800 | 800 | 1,000 | 1,000 |
| Residual fuel oil | do. | 36,000 | 35,200 | 29,400 r/ | 35,400 | 36,000 |
| Bitumen e/ | do. | -- | 1,500 | 1,500 | 1,500 | 1,500 |
| Petroleum coke e/ | do. | 726 3/ | 525 | 525 | 525 | 500 |
| Other e/ | do. | -- 3/ | 400 | 400 | 400 | 400 |
| Refinery fuel and losses | do. | 4,400 | 9,210 r/ | 5,970 r/ | 5,660 | 6,000 |
| Total e/ | do. | 77,889 3/ | 128,711 r/ | 110,568 r/ | 127,714 | 125,565 |

e/ Estimated. r/ Revised.

1/ Table includes data available through May 1996.

2/ In addition to the commodities listed, other crude construction materials are produced, but no basis exists for estimation of production.

3/ Reported figure.

4/ This is the iron content of the nickeliferous ore mined for its nickel content. There is no indication that this iron is recovered, except as the iron content of ferronickel.

TABLE 2
GREECE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1995

(Thousand metric tons unless otherwise specified)

| Commodity | Major operating companies and major equity owners | Location of main facilities | Annual capacity |
|--|---|--|--------------------------------|
| Alumina | Aluminium de Grèce S.A. (Pechiney of France, 60%) | Distomon, in Boeotia area | 640 |
| Aluminum | do. | do. | 160 |
| Asbestos | Asbestos Mines of Northern Greece S.A. (MAVE) (Hellenic Industrial Development Bank-Government, 95%; International Finance Corp., 5%) | Mines at Zidani, near Kozani | 110 |
| Barite | Silver and Baryte Ores Mining Co. S.A. (Eliopoulos-Kyriacopoulos Group) | Milos Island | 10 |
| Bauxite | Bauxites Parnasse Mining Co. S.A. (Eliopoulos-Kyriacopoulos Group) | Mines in Parnasse-Ghion area and Pasha, Euboea Island | 2,000 |
| Do. | Eleusis Bauxites Mines, S.A. (ELBAUMIN) (National Bank of Greece) | Plant in Drama and Eleusis; mines near Drama, Itea, Kimi, and Mandra | 700 |
| Do. | Delphi-Distomon S.A.; Hellenic Bauxites of Distomin S.A.; (Aluminium de Grèce S.A.) Delphi Bauxites S.A. | Opencast mines at Delphi-Distomon area | 500 |
| Bauxite | Am. E. Barlos-Bauxite Hellas Mining S.A. | Mines at Distomon (Elixon), Beotia; Processing plant at Distomon, Beotia | 300 200 |
| Bentonite: | | | |
| Crude | Mediterranean Bentonite Co. S.A. (Industria Chimica Mineraria S.p.A., Italy) | Surface mines on Milos Island | 20 |
| Do. | Mykobar Mining Co. S.A. (MI Drilling Fluids) | Mines at Adamas, Milos Island Plants at Adamas, Milos Island | 180 150 |
| Do. | Silver and Baryte Ores Mining Co. | Mines at Adamas, Milos Island | 500 |
| Processed | do. | Plant at Vouidia Bay, Milos Island | 400 |
| Cement | Halkis Cement Co. S.A. | Micro-Vathi plant, west-central Euboea | 3,000 |
| Do. | Halyps Ciment S.A. (Ciments Français, France) | Paralia Aspropyrgos plant, Athens | 800 |
| Do. | Heracles General Cement Co. S.A. (Industrial Reconstruction Organization [IRO], 69.8%) | Plant at Milaki Plant at Volos | 1,900 4,600 |
| Do. | Titan Cement Co. S.A. | Elefsis plant, Athens area Kamari plant, Boeotia Patras plant, northern Peloponnesus Salonica plant, Salonica | 400 2,600 1,900 1,650 |
| Chromite | Financial Mining-Industrial and Shipping Corp. (FIMISCO) (IRO) | Tsingeli mines and plant near Volos | 25 |
| Ferroalloys: Ferronickel, Ni content | General Mining & Metallurgical Co. SA (LARCO) (IRO) | Larymna Metallurgical Plant | 25 |
| Lead, concentrate, Pb content | Hellenic Chemical Products and Fertilizer S.A. (Bodossakis Group) | Kassandra mines (Olympias; Stratoni) northeast Chalkidiki | 31 |
| Lignite | Public Power Corp. (DEH) (Government) | Aliveri mine, Euboea Island Megalopolis mine, central Peloponnesus Ptolemais mine, near Kozani | 420 7,000 28,000 |
| Magnesite, concentrate | Financial-Mining-Industrial and Shipping Corp. (FIMISCO) (Government owned - IRO) | Mines at Gerorema, Kakavos, and Paraskevorema, northern Euboea Island | 350 |
| Do. | Grecian Magnesite S.A. (operations suspended in 1992) | Mines at Yerakini and Kastri in Chalkidiki | 400 |
| Do. | Magnomin-General Mining Co. S.A. (A subsidiary of Radex Eraclit Industrie Beteiligungs GmbH, Austria) | Mines at Vavdos, Chalkidiki Processing plant at Vavdos | 68 60 |
| Manganese (battery-grade MnO ₂ concentrate) | Eleusis Bauxite Mines Mining, Industrial and Shipping S.A. (National Bank of Greece [OAE]) | Nevrokopi, Drama | 4 |
| Natural gas | million cubic meters per day Public Petroleum Corp. (DEP) (Government) | Prinos offshore gasfield and oilfield, east of Thasos Island | 125 |
| Nickel, ore | General Mining & Metallurgical Co. S.A. (LARCO) (IRO) | Agios Ioannis mines near Larymna Mines at Euboea | 500 |

TABLE 2--Continued
GREECE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1995

(Thousand metric tons unless otherwise specified)

| Commodity | Major operating companies and major equity owners | Location of main facilities | Annual capacity | |
|-------------------------------|---|---|-------------------------|---------|
| Perlite | Silver and Baryte Ores Mining Co. S.A. | Kos and Milos Islands | 250 | |
| | | Plant at Pireaus | 300 | |
| Do. | Otavi Minen Hellas S.A. (Otavi Minen AG, Germany) | Milos Island | 120 | |
| Do. | Peletico Hellas S.A. (Peletico Ltd. of Cyprus) | do. | 20 | |
| Do. | N. Bournas & Co. | Kos Island | 75 | |
| Petroleum, refined | 42-gallon barrels per day | Hellenic Aspropyrgos Refinery S.A. | Aspropyrgos | 95,000 |
| Do. | do. | Motor Oil (Hellas) Corinth Refineries S.A. | Aghii Theodori, Corinth | 140,000 |
| Do. | do. | Petrola Hellas S.A. | Eleusis | 100,000 |
| Do. | do. | Thessaloniki Refining Co. A.E. | Thessaloniki | 76,000 |
| Pozzolan (Santorin earth) | Lava Mining & Quarrying Co. Ltd. (Heracles General Cement Co. S.A.) | Quarries on Ghyali Island | 800 | |
| Steel, crude | Halyvourgia Thessalias S.A. (A subsidiary of Manassis Bros. and Voyatzis S.A. (65%); the balance, 35%, owned by state-owned National Investment Bank for Industrial Development - NIBID) | Steelworks at Volos (operates two 35-ton electric arc furnaces) | 1,500 300 200 | |
| Do. | Halyvourgiki, Inc. | Steelworks at Eleusis (three 100-ton electric arc furnaces) | 1,200 | |
| Do. | Helleniki Halivourgia S.A. | Steelworks at Aspropyrgos (two 55-ton electric furnaces) | 400 | |
| Do. | Sidenor S.A. (also known as Halivorgia Voviou Ellados S.A.) | Steelworks at Nea Maguisia, near Thessaloniki (two 55-ton and two 30-ton electric arc furnaces) | 350 | |
| Zinc, concentrate, Zn content | Hellenic Chemical Products and Fertilizer Co. (Bodossakis Group) | Kassandra mines (Olympias, Stratoni), northeast Chalkidiki | 25 | |

TABLE 3
GREECE: RESERVES OF SELECTED MINERAL COMMODITIES 1/
FOR 1994

(Million metric tons unless otherwise specified)

| Commodity | Reserves | |
|---------------------------|----------------------|--------|
| Asbestos | 4 | |
| Barite | 4 | |
| Bauxite | 750 | |
| Chromite | 16 | |
| Gas, natural | billion cubic meters | 8 |
| Iron | 70 | |
| Lead, content of ore | .7 | |
| Lignite | 3,570 | |
| Magnesite | 50 | |
| Manganese, content of ore | 2 | |
| Nickel, content of ore | 3 | |
| Petroleum, crude | thousand barrels | 41,000 |
| Perlite | 200 | |
| Pyrite | 6 | |
| Zinc, content of ore | 1.3 | |

1/ Measured and inferred reserves.